Gear Up for Calculus

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Scenario mathematics anxiety among university students becomes a popular issue around the world since 1970's. Ersozlu and Karakus (2019) stated 537 papers on mathematics anxiety had been published in various databases Web of Sciences between 2000 and 2018. Numerous studies about the causes of mathematics anxiety and its impact on the students' achievement in schools or college and their career choice had been investigated (Richardson & Suinn, 1972; Tobias & Weissbrod, 1980; Hembree, 1990; Ma & Kishor, 1997; Miller & Bichsel, 2004; Vitasari et.al. 2010; Estonanto, 2017).

Mathematics anxiety has been discovered to discourage students at tertiary level from learning calculus and engineering mathematics confidently. Hence, it affects students' performance in calculus and they encounter the problem of utilizing calculus in the related engineering courses. Therefore, the issue arises the concern of all the educators to design the feasible of teaching and learning mathematics in calculus or engineering mathematics. Mastering the fundamental mathematics in calculus will ease the learning in different field. Hence, there are a few guidelines for students in calculus learning.

Tip 1: Revise basic algebra rules

You really need to revise all the basic rules in algebra such as expanding, factorising, simplifying the expression in the exponent form or the rational form. If not, you will miss a lot of marks regarding the algebra work of a calculus problem. For example, students must always beware of the distributive law of algebra $a(b \pm c) = ab \pm ac$ especially when the a is negative

real numbers. The expansion of $-(b \pm c) = -b \mp c$ will be occurred when the students use the property in expression or equation.

Furthermore, students need to recall the five basic laws of exponents such as $a^m \cdot a^n = a^{m+n}$, $a^m \div a^n = a^{m-n}$, $(a^m)^n = a^{mn}$, $a^m \cdot b^m = (ab)^m$ and $a^m \div b^m = \left(\dfrac{a}{b}\right)^m$. They must use the property to simplify the expression or equation when they attempt to solve the derivative or integration in the calculus problem.

Tip 2: Make sense of the formulas and memorize them

Memorizing a formula without asking why and how is a time wasting in learning calculus. Students must know the formulation of the equations or theorems using logic and critical thinking. Sometimes, you need to memorize the theorem or definition to solve a practical problem.

For example, when students are required to explore the convergence or divergence in an infinite series. Firstly, they must understand the basic definition of infinite series. Then, you need to understand the hypotheses and conclusions of the theorem using the logical and reasoning thinking. You will use the accurate theorem to find out how the infinite series converge or diverge.

Students always struggle to use the formulas in finding the derivative and integrals in calculus. You need to study through all the basic rules in those formulas before solving the problem involving rate of change or optimum values in economic, estimation. Besides, you are encouraged to use mnemonic method to improve the learning in calculus.

Tip 3: Review the graphing skill

Graphs are the essential tools in all fields especially in calculus. You need to revise all the fundamental graphs such as linear function, quadratic function, absolute value function, exponential function, trigonometry functions and so on. The topics in calculus such as limits, area of functions and volume of solid in two dimensional or three dimensional require the prior knowledge. Without the solid skill in sketching the mentioned graphs, you have the difficulty

to interpret, transform and model it. You also can use Geogebra or Wolfram Alpha to enhance the graphing skills because the free online softwares serve the users interactively.

Tip 4: Positive attitude

Learning calculus requires extra effort and attention. You need to pay close attention to every lecture and tutorial. Moreover, you need to do more exercises than are assigned to. Once you do not able to grasp the concept in calculus, you must approach to the lecturer immediately. The 'negative' thought of students like '*calculus is difficult and challenging*' must be avoided. Keeping those positive attitudes towards calculus will help you to achieve better performance in academic. According to Inamori (1995), I strongly believe that success = attitude x work x ability where the main three elements are the core success in your calculus. Attitude plays the major role in that formula.

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